

Response Under 37 CFR 1.116
Expedited Procedure
Examining Group 2837
Application No. 10/730,162
Paper Dated: April 22, 2008
In Reply to USPTO Correspondence of January 31, 2008
Attorney Docket No. 4444-032065

REMARKS

The Office Action dated January 31, 2008 has been reviewed and the Examiner's comments carefully considered. Claims 1, 2 and 4-20 are pending in this application, and claims 1, 14, 15 and 17 are in independent form.

In the present Action, the Examiner has reiterated the rejections of pending claims 1, 2 and 4-20 over the prior art cited throughout prosecution of this application. In particular, claims 1, 2, 4, 6-8 and 14 stand rejected under 35 U.S.C. § 103(a) as being obvious over the previously-cited Ward patent (U.S. Patent No. 4,076,098) in view of U.S. Patent No. 7,123,738 to Mizone and Japanese Patent No. 63187900 to Ono. Claims 9-12 and 15-17 stand rejected under 35 U.S.C. § 103(a) as being obvious over the Ward patent, the Mizone patent, the Ono patent and the Kanada publication (U.S. Patent Publication No. 2002/0045040). Claims 18-20 stand rejected under 35 U.S.C. § 103(a) as being obvious over the Ward patent, the Mizone patent, the Ono patent, the Kanada publication, in further view of the Yamaji patent (U.S. Patent No. 5,055,341). Further, claim 13 stands rejected under 35 U.S.C. § 103(a) as being obvious over the Ward patent, the Mizone patent and the Ono patent, in further view of the Thomas patent (EP 0 508 596). Finally, claim 5 stands rejected under 35 U.S.C. § 103(a) as being obvious over the Ward patent, the Mizone patent and the Ono patent, in further view of EP 0508596 to Thomas. Claim 5 stands rejected under 35 U.S.C. § 103(a) as being obvious over the Ward patent, the Mizone patent, the Ono patent, and in further view of the Inoue (U.S. Patent No. 6,378,649) and Ogura patents (U.S. Patent No. 5,744,761). In view of the following remarks, Applicants respectfully request reconsideration of these rejections.

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Summary of the Invention

According to independent claim 1 of the present application, provided is a loudspeaker diaphragm. This loudspeaker diaphragm includes a base layer having a woven fabric, and the woven fabric is polyethylene naphthalate fiber impregnated by a thermosetting resin. In addition, the polyethylene naphthalate fiber is an untwisted fiber.

In another embodiment, and as set forth in independent claim 14 of the present application, provided is a loudspeaker including a loudspeaker diaphragm. The diaphragm includes a base layer, which is formed from a woven fabric of polyethylene naphthalate fiber impregnated with a thermosetting resin. The polyethylene naphthalate fiber is an untwisted fiber.

Still further, and in another embodiment set forth in claim 15, provided is a method for manufacturing a loudspeaker diaphragm. This method includes the steps of: impregnating a woven fabric polyethylene naphthalate fiber with a thermosetting resin and curing the thermosetting resin, so as to form a base layer; adding an inactive gas at a super critical state to a molten thermoplastic resin and extruding the mixture of the thermoplastic resin in the inactive gas at the prescribed temperature and pressure, so as to form a thermoplastic resin layer; and laminating the base layer and the thermoplastic resin layer. As discussed above, the polyethylene naphthalate fiber is an untwisted fiber.

In a still further embodiment, and as set forth in independent claim 17 of the present application, provided is a loudspeaker diaphragm. This loudspeaker diaphragm includes a base layer as the outermost layer, as well as a thermoplastic resin layer and a thermoplastic elastomer layer. The base layer includes a woven fabric of polyethylene naphthalate fiber impregnated with a thermosetting resin, and this polyethylene naphthalate fiber is an untwisted fiber.

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The Cited Prior Art

As discussed above, the Examiner has again rejected the pending claims in view of various combinations of the previously-cited Ward patent, Mizone patent, Ono patent, Kanada publication, Yamaji patent, Thomas patent, Inoue patent and Ogura patent. Each of the independent claims of the present application include the feature: "wherein the polyethylene naphthalate fiber is an untwisted fiber." It has been and remains the Examiner's contention that the Ono patent teaches such a limitation.

The Ono patent is directed to a diaphragm for a speaker, and the Examiner admits that neither the Ward patent nor the Mizone patent teaches the use of an untwisted fiber, instead specifically referring to the Ono patent as allegedly including a roving monofilament. With specific reference to the Abstract, the Examiner has and continues to assert that the Ono patent teaches "a diaphragm having a woven base made of an untwisted fiber or roving monofilament." Applicants urge the Examiner to again review the English abstract of the Ono patent, which describes that "the skin members 3, 4 use a woven cloth 6 weaving the roving 5 being monofilament aggregate...." This means that the woven cloth 6 of the Ono patent is formed from the roving 5, not directly from the monofilament.

The Cited Prior Art Does Not Teach or Suggest a Loudspeaker Diaphragm Having a Base Layer of Woven Fabric of PEN Fiber, Where the PEN Fiber is Untwisted

First, with respect to the Mizone patent, which teaches a diaphragm made from polyethylene naphthalate (PEN) with ultra-micro foam, Applicants incorporate herein by reference all the arguments and comments made in the previously-filed Response of November 19, 2007. With respect to the Ono patent, the Examiner expressly uses this reference for the alleged teaching of a base layer having a woven fabric of a polyethylene

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naphthalate fiber, which is an untwisted fiber. As discussed above, the woven cloth taught and disclosed in the Ono patent is formed from the roving, not directly from the monofilament.

In the fiber industry, it is well known that this “roving” is a twisted member. As evidence of this, the Examiner’s attention is directed to the definition of “roving” in the *McGraw Hill Dictionary of Scientific and Technical Terms (Third Edition)*, which provides the following definition of “roving”: “Fibrous glass in which spun strands are woven into a tubular rope. [TEXT] Drawing out and slightly twisting cotton or will fibers.” (emphasis added). A copy of page 1399 of this Dictionary is attached hereto for the Examiner’s convenience. This clearly demonstrates that a roving fiber comprises slightly twisted cotton or wool fibers, i.e., a twisted bundle of the monofilaments. Therefore, the roving 5 of the Ono patent is twisted fiber.

The Examiner’s attention is also drawn to the discussion of “roving” at <http://en.wikipedia.org/wiki/roving>. In this article entry in Wikipedia, the following is stated: “A roving is a long and narrow bundle of fiber with a twist to hold the fiber together. It is usually used to spin worsted yarn, but can be used to spin wool and yarn as well.” This provides further support that the monofilament of the Ono patent is twisted to form the roving 5. A copy of this Wikipedia article is also attached hereto.

Still further, on page 2 of the full English translation of the Ono patent, it is described that the woven cloth may be formed of yarn. In the fiber industry, it is well known that yarn is also a twisted material. *See, e.g.*, the article explaining “roving” in Wikipedia. Further, and as set forth on page 1771 of the *McGraw Hill Dictionary of Scientific and Technical Terms*, “yarn” is defined as follows: “A continuous strand of two or more plies of

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carded or combed fibers twisted together, or a single filament of natural or synthetic fibers used for weaving or knitting.” A copy of page 1771 of the Dictionary is also attached hereto. Therefore, this further demonstrates that a yarn formed of monofilament is twisted for actual use, unless specifically indicated to the contrary. Therefore, the Ono patent clearly teaches a twisted fiber, not a woven fabric of a polyethylene naphthalate fiber, “wherein the polyethylene naphthalate fiber is an untwisted fiber,” as specifically set forth in independent claims 1, 14, 15 and 17 of the present application.

Summary

The cited prior art does not teach or suggest a loudspeaker diaphragm having a base layer of woven fabric of a polyethylene naphthalate fiber impregnated with a thermosetting resin, where the polyethylene naphthalate fiber is an untwisted fiber, as set forth in each of independent claims 1, 14, 15 and 17. Still further, it appears that the Examiner has and continues to avoid addressing the arguments presented in the *Response After Final Rejection* of April 9, 2007 in the Advisory Action. Therefore, and again, Applicants specifically incorporate herein by reference all the arguments made on pages 5-9 of that Response, where Applicants asserted that other factors should be considered with respect to the presently-claimed loudspeaker diaphragm, including “secondary considerations” that further demonstrate that the claimed invention is not obvious to one skilled in the art. Further, Applicants provide specific experimental results that clearly evidence new and unexpected results in the form of an improved Young’s Modulus and internal loss, which results from practicing the present invention. These new and unexpected results stem from extensive experimentation and analysis, and Applicants respectfully and

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again request the Examiner take them into consideration.

Regardless, it is clear that none of the cited prior art, whether used alone or in combination, teaches a polyethylene naphthalate fiber that is an untwisted fiber, as set forth in the independent claims. There is no hint or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Reconsideration of the rejection of independent claim 1 is respectfully requested. Claims 2-13 and 20 depend either directly or indirectly from and add further limitations to independent claim 1 and are believed to be allowable for the reasons discussed hereinabove in connection with independent claim 1.

For the above reasons, independent claim 14 is not anticipated by or rendered obvious over the prior art of record, whether used alone or in combination. There is no hint or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Reconsideration of the rejection of independent claim 14 is respectfully requested.

For the above reasons, independent claim 15 is not anticipated by or rendered obvious over the cited prior art, whether used alone or in combination. There is no hint or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Reconsideration of the rejection of independent claim 15 is respectfully requested. Claim 16 depends directly from and adds further limitations to independent claim 15 and is believed to be allowable for the reasons discussed hereinabove in connection with independent claim 15.

Finally, and for the foregoing reasons, independent claim 17 is not anticipated by or rendered obvious over the prior art of record, whether used alone or in combination.

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There is no hint or suggestion in any of the references cited by the Examiner to combine these references in a manner which would render the invention, as claimed, obvious. Reconsideration of the rejection of independent claim 17 is respectfully requested. Claims 18 and 19 depend either directly or indirectly from and add further limitations to independent claim 17 and are believed to be allowable for the reasons discussed hereinabove in connection with independent claim 17.

For all the foregoing reasons, Applicants believe that claims 1, 2 and 4-20 are patentable over the cited prior art and in condition for allowance. Reconsideration of the rejections and allowance of all pending claims 1, 2 and 4-20 are respectfully requested. To the extent the Examiner maintains these rejections in view of the arguments and discussion presented above, Applicants specifically request an interview with the Examiner to discuss this matter, Applicants' position and to move this case towards allowance.

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